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December 2014

# PUBLIC TRANSIT

## Federal and Transit Agencies Taking Steps to Build Transit Systems' Resilience but Face Challenges

# GAO Highlights

Highlights of [GAO-15-159](#), a report to congressional requesters

## Why GAO Did This Study

Public transit systems, which receive funding from the federal government, are vulnerable to catastrophic events, as demonstrated by the impact Hurricane Sandy and other events have had on transit systems. These events highlight our reliance on transit systems for access to jobs, medical care, and other services, as well as the cost of recovering from these events. For instance, of the \$50.5 billion Congress appropriated to help communities devastated by Sandy, \$10.9 billion was provided for disaster relief to public transit agencies. Building resilience—the ability to prepare for, respond to, recover from, and mitigate the risk of catastrophic events—is one strategy to help limit the nation’s fiscal exposure to catastrophic events.

GAO was asked to review transit system resilience to catastrophic events. This report examines (1) how DHS and DOT help transit agencies make their systems resilient; (2) actions selected transit agencies take to make their systems resilient; and (3) challenges transit agencies face with making their systems resilient. GAO examined documentation and interviewed officials from DHS and DOT, and officials from nine transit and five emergency management agencies. GAO selected a non-generalizable sample of agencies in five locations, chosen for transit ridership volume and variation in geography, types of risks, and transit modes.

GAO did not make any recommendations in this report. DHS and DOT provided technical comments, which were incorporated as appropriate.

View [GAO-15-159](#). For more information, contact David J. Wise, (202) 512-2834, [wised@gao.gov](mailto:wised@gao.gov)

December 2014

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### Federal and Transit Agencies Taking Steps to Build Transit Systems' Resilience but Face Challenges

## What GAO Found

The Departments of Homeland Security (DHS) and Transportation (DOT) provide funding and other support to transit agencies to help make their systems resilient to catastrophic events. DHS focuses on emergency management and security, and provides funding through its hazard-mitigation, transit-security, and other grant programs. DOT’s Federal Transit Administration (FTA) provides support through formula and discretionary-funding programs for transit capital-investment projects and for improving and maintaining existing systems. Both DHS and DOT provide transit agencies with technical assistance, such as for security programs or climate-change adaptation efforts.

Transit agencies that GAO selected identified a number of actions they are taking to help make their systems more resilient, including performing risk assessments and developing plans, such as emergency operations plans. These agencies also take actions, such as building redundant assets or facilities, to ensure the continuity of operations of the agencies’ systems. Further, transit agencies have changed their infrastructure to mitigate the potential impact of disasters on their assets. For example, as shown in the figure below, one agency elevated vents and curbs to minimize water flowing into the subway.

Although all transit agencies GAO selected are taking resilience-building actions, officials GAO interviewed said that transit agencies face challenges with placing priorities on resilience and with certain aspects of some grant programs. In particular, officials from DHS, DOT, and transit agencies GAO selected explained that it is difficult for transit agencies to place priority on resilience activities because managers may be reluctant to focus on resilience and resilience activities compete with other priorities for funding. Federal, transit-agency, and emergency-management officials also cited challenges related to some aspects of federal grants that have made it difficult for transit agencies to, among other things, incorporate resilience into disaster recovery efforts and make regional transit-networks resilient. DHS, DOT, and some transit agencies are taking some actions to address these challenges, such as developing tools to help management prioritize resilience activities.

**Deteriorated Curb Allowed Water to Flow in Subway (Left) and Raised Curb and Vent That Minimize Water Flow into Subway (Center and Right)**



Source: GAO. | GAO-15-159

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### Abbreviations

BASE	Baseline Assessment for Security Enhancement
CDBG	Community Development Block Grant
DHS	Department of Homeland Security
DOT	Department of Transportation
DRAA	Disaster Relief Appropriations Act
ERP	Emergency Relief Program
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FMA	Flood Mitigation Assistance
FTA	Federal Transit Administration
HMGP	Hazard Mitigation Grant Program
MAP-21	Moving Ahead for Progress in the 21st Century Act
MOU	memorandum of understanding
PDM	Pre-Disaster Mitigation
SEPTA	Southeastern Pennsylvania Transportation Authority
TRB	Transportation Research Board
TSA	Transportation Security Administration
TSGP	Transit Security Grant Program
TTAL	Top Transit Asset List
WMATA	Washington Metropolitan Area Transit Authority

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December 10, 2014

The Honorable Tim Johnson  
Chairman  
Committee on Banking, Housing, and Urban Affairs  
United States Senate

The Honorable Robert Menendez  
Chairman  
Subcommittee on Housing, Transportation  
and Community Development  
Committee on Banking, Housing, and Urban Affairs  
United States Senate

In recent years, the federal government, in addition to the over \$10 billion that the Department of Transportation (DOT) provides annually to transit agencies for their systems, has provided billions of dollars to help transit agencies recover from catastrophic events,<sup>1</sup> such as Hurricane Sandy.<sup>2</sup> For example, \$10.9 billion of the \$50.5 billion Congress appropriated to help communities devastated by Hurricane Sandy was provided to help affected public transit agencies repair and make their transit facilities

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<sup>1</sup> According to the Department of Homeland Security, catastrophic events are emergencies or disasters that result in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national morale, and/or government functions.

<sup>2</sup> Sandy has been referred as both a hurricane and a "Superstorm." The National Hurricane Center declared Sandy a hurricane, but changed that designation to "post-tropical" storm just before it made landfall. In this report, we refer to the event as "Hurricane Sandy."

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resilient to future disasters.<sup>3,4</sup> In addition to the financial impact, loss of transit services, and damage of related infrastructure can have negative effects on a community by impeding access to jobs, medical care, education, shopping, and other services. For example, recent severe weather events, such as major winter storms in Massachusetts and landslides in Washington State, temporarily shut down transit systems in these areas. Further, these types of weather-related events can be expected to increase. According to the United States Global Change Research Program,<sup>5</sup> the impacts and costs of weather disasters are likely to increase in significance as such events become more common and intense due to climate change.<sup>6</sup> Transit systems' vulnerability results, in part, from their open nature, the large geographic areas they cover, and the critical transportation service they provide millions of people.

The Department of Homeland Security (DHS), DOT, and the over 2,000 public transit agencies across the country play a role in minimizing transit systems' vulnerabilities to catastrophic events and helping ensure that transit agencies are resilient to all types of hazards caused by nature and people. Resilience is the capability to prepare for, respond to, recover

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<sup>3</sup> Disaster Relief Appropriations Act (DRAA), 2013, Pub. L. No. 113-2, div. A, 127 Stat. 4 (2013). These amounts are not adjusted to account for sequestration under section 251A of the Balanced Budget and Emergency Deficit Control Act of 1985, as amended, which the Office of Management and Budget calculated would amount to a 5 percent reduction in nonexempt, nondefense discretionary funding for the fiscal year.

<sup>4</sup> "The Federal Transit Administration (FTA), under its Emergency Relief Program, defines 'resilience' as 'the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions such as significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment.'" FTA defines a 'resilience project' as "a project designed and built to address existing and future vulnerabilities to a public transportation facility or system due to a probable occurrence or recurrence of an emergency or major disaster in the geographic area in which the public transportation system is located, and which may include the consideration of projected changes in development patterns, demographics, or climate change and extreme weather patterns." 49 C.F.R. § 602.5.

<sup>5</sup> The U.S. Global Change Research Program was established by Presidential Initiative in 1989 and mandated by Congress in the Global Change Research Act of 1990, Pub. L. No. 101-606, 104 Stat. 3096 (1990), to "assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change.

<sup>6</sup> Because the impacts of these events will result in increased fiscal exposure for the federal government in many areas, including critical transportation, we placed limiting fiscal exposure from climate change on our High Risk list. See [GAO-13-283, High-Risk Series: An Update](#) (Washington, D.C.: February 2013)

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from, and mitigate the risk of catastrophic events.<sup>7</sup> We previously have recommended building resilience—such as taking actions to mitigate vulnerabilities to severe weather events—as one strategy to help limit the nation’s fiscal exposure as a result of catastrophic events.<sup>8</sup> In addition, we identified challenges to building resilience, including (1) communities balancing the need to invest in hazard mitigation with other economic development goals and (2) the clarity of information needed to inform risk-based decision making.<sup>9</sup> Such challenges may affect the extent to which public transit agencies are resilient to catastrophic events.

Given the importance of public transit agencies and their vulnerability to adverse weather and other catastrophic events that disrupt transit services and damage transit infrastructure and investments, you asked us to identify how public transit agencies make their systems resilient to catastrophic events. This report examines (1) how DHS and DOT help transit agencies make their systems resilient to catastrophic events; (2) actions selected transit agencies take to make their systems resilient; and (3) challenges transit agencies face with making their systems resilient to such events. Our review focuses on all-hazard catastrophic events; that is, those caused either by nature (e.g., hurricanes, flooding, fires) or by humans (e.g., security events, including terrorism).

To determine the activities DHS and DOT take to help transit agencies make their systems more resilient to catastrophic events, we reviewed and analyzed documentation from the two federal agencies on their relevant programs, requirements, guidance, policies, and technical assistance. We also interviewed officials from these two agencies.<sup>10</sup> To identify actions selected transit agencies take to make their systems more resilient, we reviewed documentation and interviewed officials from nine

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<sup>7</sup> According DHS, mitigation is the effort to reduce loss of life and property by lessening the impact of disasters.

<sup>8</sup> See for example GAO, *Disaster Resilience: Actions Are Underway, but Federal Fiscal Exposure Highlights the Need for Continued Attention to Longstanding Challenges*, [GAO-14-603T](#) (Washington, D.C.: May 14, 2014) and GAO, *Climate Change: Future Federal Adaptation Efforts Could Better Support Local Infrastructure Decision Makers*, [GAO-13-242](#) (Washington, D.C.: Apr. 12, 2013).

<sup>9</sup> See [GAO-14-512](#) and [GAO-14-603T](#).

<sup>10</sup> The U.S. Coast Guard has responsibilities over the security of ferry systems. We did not include the Coast Guard in the scope of our study.

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transit agencies and five local emergency management offices in five metropolitan areas: Los Angeles Region, California; Miami, Florida; Philadelphia, Pennsylvania; Seattle/Puget Sound Region, Washington; and Washington, D.C. These areas are among the 10 largest metropolitan areas in terms of transit ridership and were selected to obtain variation in geography, types of risks, and transit modes.<sup>11</sup> In each metropolitan area, we selected transit agencies that had relatively high ridership and were located in the selected city itself or provided service to the city. The nine transit agencies, which we visited, are listed below.

- Los Angeles County Metropolitan Transportation Authority (Los Angeles Region, California);
- Orange County Transportation Authority (Los Angeles Region, California);
- Southern California Regional Rail Authority (Metrolink) (Los Angeles Region, California);
- Miami-Dade Transit (Miami, Florida);
- Southeastern Pennsylvania Transportation Authority (SEPTA) (Philadelphia, Pennsylvania);
- Washington State Ferries (Seattle/Puget Sound Region, Washington);
- King County Metro Transit (Seattle/Puget Sound Region, Washington);
- Sound Transit (Seattle/Puget Sound Region, Washington); and
- Washington Metropolitan Area Transit Authority (WMATA) (Washington, D.C.).

While the information we obtained from the five metropolitan areas is not generalizable to transit systems nationwide, the selected areas have

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<sup>11</sup> Ridership is based on FTA's 2011 National Transit Database's total unlinked passenger trips. Total unlinked passenger trips are the number of passengers who board public transportation vehicles. Passengers are counted each time they board vehicles no matter how many vehicles they use to travel from their origin to their destination.



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some of the larger transit systems in terms of ridership. To identify challenges transit agencies face with making their systems resilient to catastrophic events, we interviewed officials from DOT, DHS, the nine transit agencies, five emergency management offices, and four researchers knowledgeable in transit systems, emergency management, or federal transportation programs. We analyzed the information gained from these interviews to identify the most frequently cited challenges. Appendix I describes our objectives, scope, and methodology in greater detail.

We conducted this performance audit from October 2013 through December 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions on our audit objectives.

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## Background

In response to the risks posed by man-made and natural disasters, such as acts of terrorism and severe weather, over the past decade the federal government has emphasized the need to improve the resilience of the nation's critical infrastructure through various national policies (see table 1). These policies—which focus on critical infrastructure, national preparedness, and climate change or weather-related events—address resilience in the context of homeland security (e.g., terrorism) and natural disasters. The federal government has targeted 16 critical infrastructure areas for resilience-building policies. Transportation infrastructure, which includes public transit systems, is one of these areas.<sup>12</sup>

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<sup>12</sup> The other 15 critical infrastructure sectors are chemical; commercial facilities; communications; critical manufacturing; dams; defense industrial base; emergency services; energy; financial services; food and agriculture; government facilities; healthcare and public health; information technology; nuclear reactors, materials, and waste; and water and wastewater systems.

**Table 1: National Policies That Emphasize Resilience of the Nation’s Critical Infrastructure, Including Public Transit**

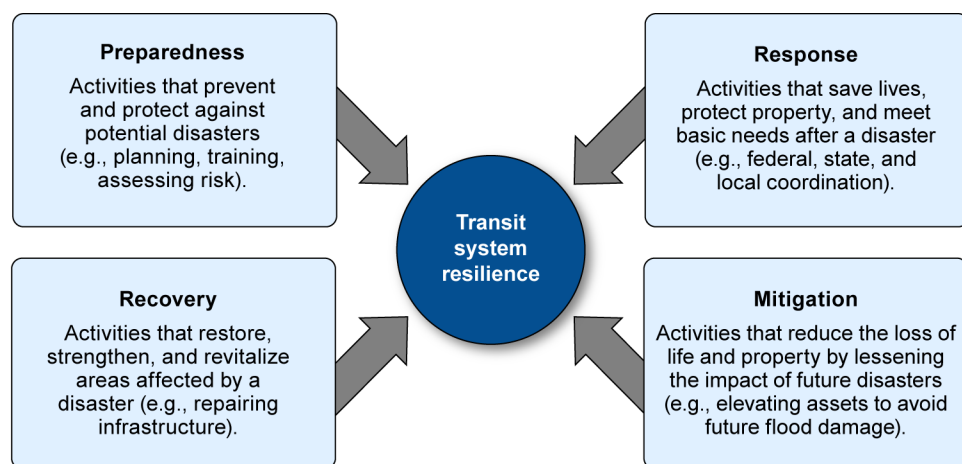
Focus of national policy	National policy	Purpose
Critical Infrastructure	Homeland Security Presidential Directive-7: Critical Infrastructure Identification, Prioritization, and Protection Issued on December 17, 2003	Designates the nation’s mass transit systems, among other types of transportation systems, as critical infrastructure.
	National Infrastructure Protection Plan 2013: Partnering for Critical Infrastructure Security and Resilience Issued in 2006 and updated in 2009 and 2013	A strategic framework that describes how federal, state, and local government and private sector, and non-profit participants should work together to manage risks and achieve security and resilience outcomes in critical infrastructure.
	Presidential Policy Directive-21: Critical Infrastructure Security and Resilience Issued on February 12, 2013	Establishes a national policy on critical infrastructure security and resilience.
National preparedness	National Security Presidential Directive-51/Homeland Security Presidential Directive-20: National Continuity Policy Issued May 9, 2007	Establishes a comprehensive national policy to help ensure the continuity of essential functions following an emergency.
	Presidential Policy Directive-8: National Preparedness Issued on March 30, 2011	Identifies the need for a national preparedness goal and strategy aimed at strengthening the nation’s security and resilience through systematic preparations against terrorist acts and catastrophic natural disasters, among other things. This policy directive replaced Homeland Security Presidential Directive-8: National Preparedness, which was issued on December 17, 2003.
Climate change or weather-related events	Department of Transportation Policy Statement on Climate Change Adaptation Issued in June 2011	States that DOT shall consider climate change impacts on current systems and future investments, and incorporate climate adaptation strategies into its transportation missions, programs, and operations. This policy statement is in the process of being updated.
	Executive Order 13632: Establishing the Hurricane Sandy Rebuilding Task Force Issued on December 7, 2012	Establishes the Hurricane Sandy Rebuilding Task Force to provide coordination necessary to support long-term rebuilding in the affected areas.
	Executive Order 13653: Preparing the United States for the Impacts of Climate Change Issued on November 6, 2013	Directs the federal government to pursue new strategies to improve the nation’s preparedness and resilience to the impacts of climate change, including in the area of critical infrastructure.

Source: GAO analysis. | GAO-15-159

Actions that can help transit agencies prepare for, respond to, recover from, and mitigate the risk of catastrophic events can contribute to transit

system resilience.<sup>13</sup> These actions can be taken before, during, and after an event (see fig. 1). For example, transit agencies can develop plans to help them prepare for a catastrophic event before it occurs, and can repair transit infrastructure after an event so that the infrastructure can better withstand similar events in the future.

**Figure 1: Actions That Can Contribute to Transit System Resilience**



Source: GAO analysis of DHS documentation on addressing risks. | GAO-15-159

In large part, the actions for resilience-building efforts noted in figure 1 occur at the local level and are specific to the needs, scope, and risks of the transit systems, factoring in state and local priorities. However, the Stafford Act of 1988, as amended,<sup>14</sup> mandated a role for the federal government in assisting state and local governments to carry out their responsibilities to alleviate the damage from disasters. Today, federal agencies—DHS and DOT, in particular—share federal oversight of and

<sup>13</sup> Resilience can incorporate a number of activities, such as engaging the whole community in the planning phase, linking public and private infrastructure interests, and communicating risks throughout the community.

<sup>14</sup> Pub. L. No. 100-707, 102 Stat. 4689 (1988). Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, constitutes the statutory authority for federal disaster response activities especially as they pertain to FEMA and FEMA programs

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assistance for critical infrastructure, including transit systems.<sup>15</sup> Moreover, DHS and DOT are the federal agencies responsible under the National Infrastructure Protection Plan for promoting national resilience-related polices in public transit systems. DHS has primary responsibility for transportation security and emergency preparedness and response. DHS's Transportation Security Administration (TSA) is the primary federal agency overseeing security matters for public transit systems and provides technical assistance to transit agencies to augment their system security.<sup>16</sup> DHS's Federal Emergency Management Agency (FEMA) has responsibility for administering the public transportation-security grant provisions of the 9-11 Act<sup>17</sup> and is the lead federal agency responsible for building the nation's capability to prepare for and respond to all-hazards catastrophic events. Transit agencies can apply to FEMA for grants for emergency planning, response, recovery, and mitigation efforts—either directly or through their states, depending on the type of grant. DOT's Federal Transit Administration (FTA) provides funds to help develop new transit systems and improve, maintain, and operate existing systems; and provides technical assistance as needed to transit systems. As specified by law,<sup>18</sup> FTA's programs for funding transit systems operate as either formula or discretionary grants<sup>19</sup> for certain types of capital or operating expenses.<sup>20</sup> As discussed below, until recently FTA did not have funds

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<sup>15</sup> In addition to FEMA's mitigation funds, communities may be able to seek recovery funds for resilience projects from other federal agencies, including the Department of Housing and Urban Development's Community Development Block Grant (CDBG) funds. CDBG funds are allocated to states by formula.

<sup>16</sup> After the establishment of DHS by the Homeland Security Act of 2002, Pub. L. No. 107-296, 116 Stat 2135 (2002), oversight of public transit systems' security was transferred from DOT to DHS. The two departments have signed a memorandum of understanding to clarify their respective authorities over public transit systems and to provide departmental coordination.

<sup>17</sup> Sections 1405 (6 U.S.C. § 1134) and 1406 (6 U.S.C. § 1135) of the Implementing Regulations of the 9/11 Commission Act of 2007 (9-11 Act), Pub. L. No. 110-53, 121 Stat. 266, 402 (2007).

<sup>18</sup> 49 U.S.C. § 5307 (Urbanized areas), § 5310 (Formula Grants for the enhanced mobility of seniors and individuals with disabilities), § 5311 (non-urbanized areas), § 5337 (State of Good Repair Grants), §§ 5339 (and 5324) (Bus and Bus Facilities Formula Grants). Discretionary grants are authorized under 49 U.S.C. § 5309.

<sup>19</sup> Formula grants are allocated based on formulas prescribed in statute or regulation. Discretionary grants are generally awarded on a competitive basis to eligible applicants for specific projects.

<sup>20</sup> Funds under §§ 5307, 5311 (and 5324) are eligible to be used for operating expenses.

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authorized specifically for resilience or disaster assistance for transit systems.

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## DHS and DOT Assistance Can Contribute to Transit System Resilience; However, Some Limitations Exist

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### DHS Assistance Focuses on Security and Emergency Management

Created to strengthen the security of the nation's transportation systems, TSA sets priorities for protecting and evaluating the security of public transit systems. FEMA, as the federal agency responsible for emergency management, has certain grant programs that provide funds that may be used for transit systems' resilience-related activities both before and after catastrophic events. As noted by DHS and transit officials, some changes in funding levels and timing of grant availability can limit transit agency and local use of federal assistance.

### TSA

According to DHS officials, TSA employs a risk-based strategy to determine security risks on public transit systems. DHS maintains a Top Transit Asset List (TTAL) to identify critical infrastructure assets that are vital to the continuity of major transit systems and whose destruction would be detrimental to the region and even the nation. TSA uses the TTAL to help target technical assistance, and FEMA uses it to allocate transit security grants to reduce risks associated with major transit systems, especially in large metropolitan areas.

As part of its risk-based approach, TSA conducts 30 to 34 Baseline Assessment for Security Enhancement (BASE) reviews of public transit agencies per year, which support transit agency resilience in several

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ways.<sup>21</sup> For example, TSA uses BASE to evaluate the efficiency and effectiveness of transit agencies' security and emergency response programs and to identify existing security guidelines and requirements and security gaps so the evaluated transit agency can prioritize actions to address vulnerabilities to enhance security. Officials from DHS and transit agencies we visited said that the BASE reviews are an effective tool to assess a transit agency's security program. According to DHS officials, DHS also uses the results of the BASE reviews in the selection process for Transit Security Grant Program (TSGP) grants; the TSGP is discussed further below. Furthermore, TSA disseminates best practices, identified in part through the BASE program, among regional and national transit agencies, emergency management agencies, and state agencies, which can help make transit systems more resilient. These best practices include, for example, incorporating resilience into capital project design. Moreover, DHS has stated that, as critical infrastructure is built and refurbished, those involved in making design decisions should consider the most effective ways to prepare for threats and hazards, mitigate vulnerabilities, and minimize consequences.

## FEMA

FEMA administers several grant programs that transit agencies can apply for to improve the resilience of their systems. The Transit Security Grant Program (TSGP)<sup>22</sup> is a competitive program for funding projects to reduce risks associated with potential terrorist attacks and to increase the resilience of transit and other forms of critical infrastructure. Projects include installing security cameras and providing security training for transit employees. For instance, King County Metro in the Seattle/Puget Sound Region received a TSGP grant for cameras, dogs for bomb detection, and overtime costs for security staff. In addition, transit agencies that receive TSGP grants are required to take actions before applying to receive the grants to plan for and help mitigate the impact of events on transit systems. These actions include developing security plans and conducting risk assessments to identify vulnerabilities and

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<sup>21</sup> According to TSA officials, the BASE is a voluntary assessment; that is, it is an assessment used by TSA to encourage transit agency implementation of requirements, guidance, and standards—not to enforce compliance. TSA focuses BASE assessments on the nation's top 100 transit systems, as identified by FTA, based on ridership and revenues.

<sup>22</sup> Sections 1405 and 1406 of the Implementing Regulations of the 9/11 Commission Act of 2007, Pub. L. No. 110-53, 121 Stat. 266, 402 (2007), codified at 6 U.S.C. § 1134 and 6 U.S.C. § 1135, respectively.

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weaknesses in security, such as in emergency response planning and employee training. Transit agencies that receive TSGP grants are required by FEMA policy to use their grants within 2 years of receiving them, although transit agencies may request an extension through a formal request to FEMA that describes why an extension is needed.<sup>23</sup>

TSGP funds for public transit peaked in fiscal year 2009 at almost \$500 million, but were at or below \$90 million in each of the past 3 fiscal years.<sup>24</sup> See figure 2 for the annual TSGP amounts awarded for public transit from fiscal year 2005 through fiscal year 2014—the current year. Later in this report, we discuss the challenges experienced by transit agencies related to the timing of these grant funds. To determine which transit agencies receive TSGP funds, a panel of officials from different DHS agencies, including FEMA and TSA, rank and score proposed projects based on, among other things, whether agencies have assets listed in the TTAL and their BASE results.<sup>25</sup>

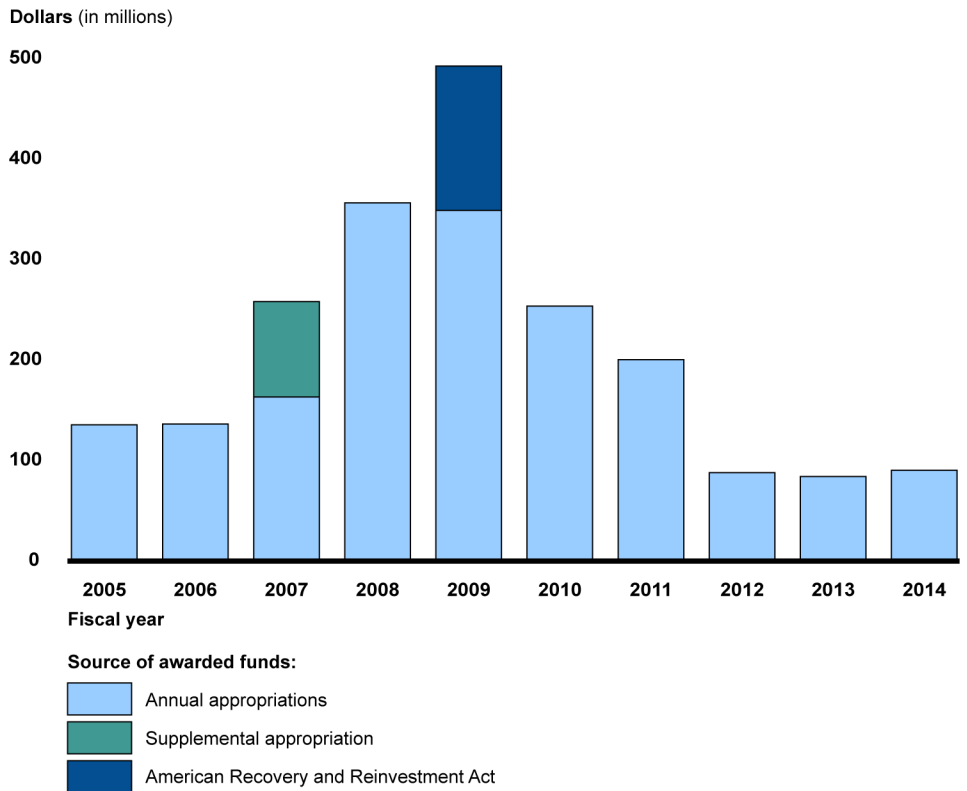
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<sup>23</sup> Prior to fiscal year 2012, FEMA typically required transit agencies to use their TSGP funds within 3 to 4 years. However, FEMA found that transit agencies were taking too long to use their grants, thus resulting in large balances of unused funds. As a result, in fiscal year 2012, DHS changed the period of performance for the TSGP grants to 2 years to encourage transit agencies to use their grants quickly.

<sup>24</sup> TSGP funds awarded for public transit were made available through annual appropriations, starting in fiscal year 2005. Funds were also provided through a supplemental appropriation in fiscal year 2007, and the American Recovery and Reinvestment Act of 2009 in fiscal year 2009.

<sup>25</sup> According to a FEMA official, FTA is invited to be part of this panel and has participated in some years, depending on availability of FTA staff.

**Figure 2: Transit Security Grant Program (TSGP) Funds Awarded for Public Transit, Fiscal Years 2005 through 2014**



Source: GAO analysis of funding data provided by DHS on the TSGP | GAO-15-159

FEMA also administers a Port Security Grant Program, designed to directly support maritime transportation-infrastructure security activities, such as improvement of port-wide maritime security-risk management, maritime security-training exercises, and maritime security-mitigation protocols that support port recovery and resilience capabilities. According to DHS officials, ferry systems that are awarded these funds cannot also apply for TSGP funds for the same project.

In addition to the TSGP and Port Security Grant Program, transit agencies are eligible for the Homeland Security Grant Program. These grants, such as the Urban Areas Security Initiative, are aimed at helping metropolitan areas build and sustain national preparedness. However, transit agencies cannot apply directly for these funds. State Administrative Agencies apply for these grants on behalf of the state and



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its subgrantees, including transit agencies and other local entities seeking such funds.

FEMA's disaster- and hazard-mitigation grant programs can also be used for helping make transit systems resilient. Public Assistance, typically the largest of these programs, focuses on immediate post-disaster recovery efforts and its grants can be used for removing debris, implementing emergency protective measures, and repairing or replacing damaged public equipment or facilities. Public Assistance funds also may be used for hazard mitigation measures to damaged infrastructure to reduce the likelihood of future damage. According to FEMA officials, transit agencies are also eligible for three FEMA mitigation grant programs—Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) Program, and Flood Mitigation Assistance (FMA) Program—that primarily fund weather-related resilience efforts, such as implementing flood control measures or protection from the effects of earthquakes. Transit agencies in the wake of recent disasters have used mitigation funds to support resilience projects.<sup>26</sup>

While FEMA's mitigation grant programs can help transit agencies carry out resilience-type projects, we identified two limitations transit agencies face in trying to obtain such funds. First, to obtain FEMA funding, transit agencies must apply through their state government as opposed to applying directly to the federal government. Thus, transit agencies are competing with other state and local organizations, including non-transit-related organizations such as housing organizations and public utilities, for FEMA funds. Second, FEMA officials noted that because various FEMA grants and other federal funds to aid recovery and resilience building after a catastrophic event have different regulations and timeframes, it could be difficult for the grant recipients to coordinate the

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<sup>26</sup> According to FEMA officials, to get information about how these funds were used by transit agencies, they would need to ask the states for the information. While FEMA tracks information on the funds at the state level, it does not track how states disseminate funds among all their sub-grantees.

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use of these funds for resilience efforts.<sup>27</sup> We will discuss challenges that transit agencies and others indicate arise from competing priorities and the timing of federal grants in more detail later in the report.

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### DOT Focuses on Transit Funding and Technical Assistance

DOT provides funding and technical assistance to transit agencies to improve their resilience. DOT requires that transit agencies with light rail, heavy rail, or other rail “fixed-guideway systems” have hazard and emergency management programs, and develop security plans.<sup>28</sup> As we discussed above, actions that help transit agencies prepare for catastrophic events, such as developing plans, can help build transit system resilience.

### FTA Formula and Discretionary Funds

FTA provides financial assistance through various formula and discretionary programs for transit capital-investment projects and for improving and maintaining existing systems. All of these programs, except for the new Public Transportation Emergency Relief Program (ERP), allow but do not provide specifically for improvements for transit systems’ resilience to catastrophic events. However, according to FTA officials, activities to build resilience in transit systems are eligible capital expenses under these programs. For example, a transit agency could use

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<sup>27</sup> In March 2010, we found that some federal recovery funds after Hurricane Ike in 2007 and the Midwest floods in 2008 were released shortly after the disasters, making it challenging for some state and local governments to focus on recovery because they had limited capacity to do so at that time. In that report, we recommended that DHS, among other things, establish a long-term recovery structure to more effectively align the timing and level of involvement of the entity responsible for coordinating long-term community recovery assistance with the capacity of the affected state and local governments. See GAO, *Disaster Recovery: FEMA’s Long-term Assistance Was Helpful to State and Local Governments but Had Some Limitation*, [GAO-10-404](#) (Washington, D.C.: Mar. 30, 2010). In September 2011, FEMA issued the National Disaster Recovery Framework, which established a recovery structure intended to more effectively align the timing and level of long-term community recovery assistance with the capacity of state and local governments. In early 2015, GAO will issue a report that will evaluate whether Hurricane Sandy-affected areas are incorporating resilience into recovery efforts, and the challenges stakeholders in these areas experience.

<sup>28</sup> FTA defines a rail “fixed guideway system” as any light, heavy, or rapid rail system, monorail, inclined plane, funicular, trolley, or automated guideway that: (1) is not regulated by the Federal Railway Administration; and (2) is included in FTA’s calculation of fixed guideway route miles, or receives funding under FTA’s formula programs for urbanized areas; or (3) has submitted documentation to FTA indicating its intent to be included in FTA’s calculation of fixed-guideway route miles to receive funding under FTA’s formula programs for urbanized areas. 49 C.F.R. § 659.5.

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Section 5339—Bus and Bus Facilities Program funds<sup>29</sup> to build a new bus facility on higher land to make it less vulnerable to floods.

FTA grantees are responsible for managing their programs in accordance with federal requirements, and FTA is responsible for ensuring that grantees follow federal statutory and administrative requirements. While FTA does not require transit agencies' use of such grants for resilience projects, FTA officials said that one way to ensure that transit agencies practice resilience is the grant requirement<sup>30</sup> that grantees maintain FTA-funded assets in good operating order for the duration of their "useful life" or expected period of service. FTA may require that transit agencies refund FTA for the portion of an FTA-paid asset if that asset does not last the minimal life cycle for that asset. FTA officials stated that this requirement could incentivize transit agencies to take actions that could contribute to system resilience. For example, the useful life requirement could encourage transit agencies to adopt improved asset management practices, which also improve the resilience of transit assets.<sup>31</sup> However, in cases of disasters, FTA can waive this requirement. FTA waived this requirement for the buses that were destroyed by Hurricane Katrina and thus were taken out of service before reaching their minimum useful life. FTA officials further told us that, as permitted under the Stafford Act, FTA waived the remaining useful life for property damaged or destroyed by Hurricane Sandy.

In addition to federal requirements, FTA officials told us that local building codes and current industry design standards could help transit agencies build resilience. For instance, according to transit officials we spoke with in California, California's stringent seismic codes enable transit systems to build to better withstand earthquakes. Research has shown that design improvements have resulted in stronger, more resilient transit vehicles that can better withstand terrorist attacks.

#### FTA Emergency and Disaster-Related Fund

Among other things, the Moving Ahead for Progress in the 21st Century Act (MAP-21) authorized the Public Transportation Emergency Relief Program (ERP) within FTA, which provides grants for, among other

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<sup>29</sup> 49 U.S.C. § 5339.

<sup>30</sup> FTA Circular 5010.1D, *Grant Management Requirements*, (Nov. 1, 2008).

<sup>31</sup> According to FTA officials, FTA does not track how often grantees have been required to return funds if their assets did not last through their useful life.

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things, capital projects to protect, repair, reconstruct, or replace equipment and facilities of public transportation systems that the DOT Secretary determines are in danger of suffering serious damage, or have suffered serious damage, as a result of an emergency.<sup>32</sup> A transit agency can apply directly for these grants without having to go through its state government (as required for most FEMA grants). Under the FTA ERP, damaged or threatened transit equipment and facilities can be repaired as well as made more resilient to current and future conditions and risks. Further, operating costs to cover evacuation activities, rescue operations, and temporary transit services are also eligible uses of the FTA ERP. While similar to the Federal Highway Administration's (FHWA) ERP for highway facilities, the FTA ERP has not received funding on an ongoing basis, which could limit some transit agencies' ability to respond immediately after a disaster. The FHWA ERP is authorized to obligate a specific amount annually to be paid from the Highway Trust Fund,<sup>33</sup> supplemented by appropriations from the General Fund of the U.S. Treasury,<sup>34</sup> on an as-needed basis. While MAP-21 authorized the FTA ERP, Congress, to date, has not provided annual appropriations for the program. The Disaster Relief Appropriations Act, however, provided a one-time appropriation of \$10.9 billion for FTA's ERP for recovery, relief, and resilience efforts in areas affected by Hurricane Sandy.<sup>35, 36</sup> Table 2 shows how FTA allocated the ERP funds.

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<sup>32</sup> Pub. L. No. 112-14, § 20017(a), 126 Stat. 405, 703, codified at 49 U.S.C. § 5324.

<sup>33</sup> The Highway Trust Fund is an account established by law to hold federal highway user tax receipts (e.g., receipts for federal excise taxes on fuel and other taxes on commercial trucks) that are dedicated for highway and transit related purposes.

<sup>34</sup> The General Fund of the U.S. Treasury holds federal money not allocated by law to any other fund account.

<sup>35</sup> After the enactment of the Budget Control Act of 2011 (Pub. L. No. 112-25, 125 Stat. 240(2011)), this amount decreased by 5 percent.

<sup>36</sup> See GAO, *Emergency Transportation Relief: Agencies Could Improve Collaboration Begun During Hurricane Sandy Response*, [GAO-14-512](#) (Washington, D.C.: May 28, 2014) for more information about disaster relief transit agencies affected by Hurricane Sandy.

**Table 2: Allocation of the \$10.2 Billion Disaster Relief Program Appropriation for the FTA Emergency Relief Program Appropriations, as of November 2014**

Notice	Description of allocations
March 29, 2013	\$2 billion for response and recovery expenses for Sandy-affected transit agencies
May 29, 2013	\$3.7 billion for response, recovery, and local priority resilience funding
September 22, 2014	Approximately \$3.6 billion to help transit agencies in Sandy-affected areas become more resilient (e.g., seawall construction and replacement of a deteriorated drawbridge)
Not yet announced or allocated	\$0.82 billion for remaining unfunded recovery expenses incurred by affected agencies

Source: GAO analysis of FTA data. | GAO-15-159

Note: The \$10.9 billion appropriations was decreased by 5 percent as a result of the sequestration mandated by the Budget Control Act of 2011 (Pub. L. No. 112-25, 125 Stat. 240 (2011)) and after intergovernmental transfers to other bureaus and offices within DOT.

The only appropriation that the FTA ERP has received to date is for public transit in areas affected by Hurricane Sandy.<sup>37</sup> Since Sandy, there have been other catastrophic weather-related events, such as mudslides and heavy snow storms. However, Congress did not appropriate ERP funds for those events. If Congress does not appropriate ERP funds for a specific event, transit agencies can still apply through their states for FEMA’s assistance and mitigation programs or use their FTA’s formula funds. As we discuss below, FTA and transit agency officials told us that demand for limited funds makes it difficult for transit agencies to prioritize actions for building resilience versus other, more immediate needs, such as maintaining and operating existing assets.

FTA Technical Assistance  
Related to Climate Change

In May 2011, FTA issued a Policy Statement on Climate Change Adaptation and announced a Climate Change Adaptation initiative.<sup>38</sup> The initiative included funding for seven transit climate- change adaptation-assessment pilot programs for assessing the vulnerability of transit agency assets and services to climate change hazards such as heat waves and flooding to help develop strategies that transit agencies can take to mitigate or adapt their systems to better address climate change

<sup>37</sup> Pub. L. No. 113-2, div. A, title X, 127 Stat. 4, 35.

<sup>38</sup> This is in response to Executive Orders and DOT’s policy statements on climate change,

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impacts. DOT expects to issue these projects' final reports in fall 2014. These reports can be a tool, highlighting practices that transit agencies could adopt for their systems. The reports are intended to inform climate change efforts of participating transit agencies and provide information on the efforts' applicability to other transit agencies. In addition, in 2011, FTA issued a study, *Flooded Bus Barns and Buckled Rails*, which it has disseminated to the nation's transit agencies. This study focused on how transit agencies could incorporate climate change adaptation into their systems and activities—such as asset management systems, planning, and emergency response—and provided examples of strategies. In 2011 and 2012, FTA offered workshops for transit agencies on how they can adapt their transit systems so that they are more resilient to the long-term effects of climate change. Further, FTA has held training sessions and workshops for transit agencies to share lessons learned and best practices.

FTA has also funded the Transportation Research Board (TRB) to undertake a research project entitled *Improving the Resiliency of Transit Systems Threatened by Natural Disaster*. Objectives include reviewing current research and developing guidelines, strategies and tools for public transit agencies to make their systems more resilient to natural disasters and climatic events. TRB plans to issue all this work by mid-2016.

#### Other FTA Guidance, Technical Assistance, and Proposed Rulemaking

In addition to workshops, webinars, and other workgroups sponsored by the American Public Transportation Associations, FTA has held as part of the Climate Change Adaptation initiative, FTA provides guidance and training that can aid transit agencies in preparing for, responding to and mitigating the potential impact of disasters, thereby improving their systems' resilience to such disasters. For example,

- **Built-in Redundancy:** FTA encourages transit agencies to “build in” redundancy in, among other things, infrastructure, communications, and power supplies.<sup>39</sup> Redundancy of assets and operations within a transit system may help a system respond to catastrophic events by

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<sup>39</sup> Research and Special Programs Administration, U.S. Department of Transportation and John A. Volpe National Transportation Systems Center, *Transit Security Design Considerations* (November 2004); and John A. Volpe National Transportation Systems Center for Intelligent Transportation Systems Joint Program Office, U.S. Department of Transportation, *Effects of Catastrophic Events on Transportation System Management and Operations* (January 2003).

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allowing transit agencies to fall back to secondary options rather than ceasing service if a portion of the system is damaged during a disaster.

- Mutual Aid Agreements: FTA recommends—in its guidance—that transit agencies develop mutual aid agreements or memorandums of understanding (MOU) with other relevant organizations and agencies in the same or adjoining communities or areas to, among other things, formalize and authorize assistance during emergencies, so that they can quickly recover and resume operations following a disaster.<sup>40</sup>
- Capital investment decision making: MAP-21<sup>41</sup> requires FTA to develop a transit asset- management system that would, in part, assist transit agencies in prioritizing rehabilitation and replacement investments. These rehabilitation and replacement projects may help transit agencies mitigate the impacts of catastrophic events by incorporating strategies such as elevating assets above flood levels. FTA’s October 2013 *Advance Notice of Proposed Rulemaking* on a national transit asset-management system would require transit agencies to, among other things, develop transit asset- management plans to help them make these investment decisions.<sup>42</sup> In a 2013 report, we found that asset management planning is a leading practice that can help transit agencies plan and prioritize replacement and rehabilitation investments.<sup>43</sup>

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<sup>40</sup> Federal Transit Administration, *Response and Recovery for Declared Emergencies and Disasters: A Resource Document for Transit Agencies* (Washington, D.C.: April 2012).

<sup>41</sup> Pub. L. No. 112-141, 126 Stat. 405 (2012) authorized surface transportation programs through fiscal year 2014. Legislation was enacted in August 2014 extending surface transportation programs and funding through May 31, 2015, for programs authorized under MAP-21. Highway and Transportation Funding Act, Pub. L. No. 113-159, 128 Stat. 1839 (2014).

<sup>42</sup> 78 Fed. Reg. 61251 (Oct. 3, 2013).

<sup>43</sup> [GAO-13-571](#), *Transit Asset Management: Additional Research on Capital Investment Effects Could Help Transit Agencies Optimize Funding* (Washington, D.C.: July 11, 2013)

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## Selected Transit Agencies Take a Variety of Actions to Make Their Transit Systems Resilient

Officials from eight of the nine transit agencies we visited told us that they would consider their transit systems to be resilient if they can resist or minimize damage, continue operations, or resume operations quickly, if an emergency were to occur.<sup>44</sup> The transit agencies also identified a number of actions that help improve their systems' resilience, including actions that help them prepare for, respond to, recover from, and mitigate the impacts of emergencies and catastrophic events. These actions include, but are not limited to, developing plans, performing risk assessments, ensuring the continuity of transit system operations, and mitigating the impact of catastrophic events on physical assets.<sup>45</sup>

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## Transit Agencies Develop Plans and Perform Risk Assessments

All nine transit agencies have developed plans to help make their systems resilient to catastrophic events. In general, plans can help transit agencies prepare for, respond to, and recover from for catastrophic events should they occur. The plans from the transit agencies that we reviewed can generally be categorized as those that address all-hazards or those that address a specific hazard relevant for transit agencies' locations (see table 3). Transit agencies typically have multiple plans, some of which are described in the table below.

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<sup>44</sup> Officials at the remaining transit agency said that they have not adopted a definition for transit system resilience.

<sup>45</sup> When we report the number of agencies that took a particular action to make their systems resilient, this does not necessarily mean that the remaining agencies did not also take those actions. It means that those agencies did not discuss those actions in documents provided to us or during the course of our interviews.



**Table 3: Examples of Plans That Transit Agencies Use to Address Transit System Resilience**

Type of plan	Examples of plans from selected transit agencies
All-hazards plans	<ul style="list-style-type: none"> <li data-bbox="402 531 1503 611">Continuity of operations plans: Eight of the nine<sup>a</sup> selected transit agencies have continuity-of-operations plans. The continuity-of- operations plans that we reviewed describe how the agency will sustain its essential services across a wide range of potential emergencies.</li> <li data-bbox="402 621 1503 722">Emergency-operations, management, or preparedness plans: All of the selected transit agencies have emergency-operations, management, or preparedness plans. The plans that we reviewed, among other things, identify the roles and responsibilities of key personnel and describe operational procedures and protocols following an emergency.</li> </ul>
Hazard-specific plans	<ul style="list-style-type: none"> <li data-bbox="402 737 1520 842">Hurricane plan: Miami-Dade Transit has a plan that prepares the agency for hurricanes. This plan identifies the roles and responsibilities of personnel in the event of a hurricane, describes operational procedures and protocols for emergency services, identifies asset protection strategies, and provides guidance on “return to operations” procedures.</li> <li data-bbox="402 852 1520 1003">Landslide mitigation action plan: Seattle/Puget Sound Region’s Sound Transit participated in the development of a plan that describes strategies, such as building retaining walls, to mitigate the impact of landslides along portions of a railroad that are used by Sound Transit’s commuter trains. To develop this plan, Sound Transit worked with the Washington State Department of Transportation, Amtrak, and other stakeholders to identify factors of landslides and impacts to passenger rail services.</li> </ul>

Source: GAO summary of information provided by selected transit agencies. | GAO-15-159

<sup>a</sup> The remaining transit agency is in the process of developing its continuity of operations plan.

All nine transit agencies perform assessments to identify risks to their transit systems so that they can make informed decisions to mitigate the risks and improve resilience. For example, Philadelphia’s SEPTA performs a six-stage risk assessment on all of its transit stations. As a part of this assessment, SEPTA police determine the overall rating of stations based on threats, vulnerabilities, and the value of the station to the overall transit system. The agency then develops countermeasure reports that provide recommendations to address identified risks. In addition to developing recommendations to address risks, officials from some transit agencies explained that they use the risk assessments to, among other things, inform the types of training and drills the agencies conduct, or guide their investment decision-making. For example, officials from Seattle/Puget Sound Region’s Washington State Ferries told us that one risk area they identified based on a risk assessment of vessels and terminals was that many employees and passengers could sustain injuries during an emergency. As a result, the agency held training to address this risk. Officials from the Los Angeles County Metropolitan Transportation Authority told us they conducted risk assessments to identify areas susceptible to mudslides and as a result, decided to fund the building of retaining walls and fences to stop debris from falling on to the rights-of-way in those areas. Further, based on their risk assessments, officials from Seattle/Puget Sound Region’s King County Metro Transit and the Los Angeles County Metropolitan Transportation

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Authority told us that they identified security risks to their transit tunnels and, as a result, funded actions to enhance security in those tunnels.

In certain instances, transit agencies may not be able to implement solutions to address identified risks because, according to transit officials, funding may be limited, the public or labor unions may disapprove of the suggested solution, or the suggested solution may be cost prohibitive. In such situations, some officials from agencies said that they temporarily accept the risk until better or more cost-effective alternatives are available, or use existing solutions, to address the risks. For example, an official from Miami-Dade Transit explained that when funding is not available to address security risks, the agency's security program supervisors work with facilities maintenance staff to determine whether corrective measures could be addressed during facilities maintenance work.

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### Transit Agencies Take Actions to Help Ensure the Continuity of Transit Systems and to Mitigate the Impact of Catastrophic Events on Physical Assets

In addition to developing plans and performing risk assessments, all nine transit agencies showed us or told us about redundant facilities or transit assets to help ensure continuity of transit service if a portion of their systems or facilities is damaged during catastrophic events. For example:

- Six transit agencies have built, are building, or have requested funding to build backup command, control, or communications centers to direct transit operations in case the main center is affected by a catastrophic event. Some of these centers are mobile in nature so that they can change their location as needed. In general, redundant or backup centers provide transit agencies the ability to dispatch trains and buses should the main centers be unable to do so. See Fig. 3.

**Figure 3: Mobile Communications Center Used by the Los Angeles Area's Orange County Transportation Authority**



Source: Orange County Transportation Authority. | GAO-15-159

- Los Angeles area's Orange County Transportation Authority uses buses powered by natural gas to provide bus service, but this agency also maintains a small contingency fleet of diesel-powered buses in ready condition that can be placed into service immediately in an emergency. An official from this agency said that this diesel-powered fleet is a critical resource: if a major earthquake, for example, interrupts the delivery of natural gas to his location, the diesel buses could become the only emergency transportation resource capable of being refueled and providing bus service.
- Seattle/Puget Sound Region's Washington State Ferries has ferry terminals that are susceptible to damage during an earthquake. As such, to ensure that ferry service can continue in the event of an emergency, this agency has built terminals with more than one berth to increase the chances that at least one berth will remain functional to some level following a major earthquake. See figure 4 for a terminal with three redundant berths. In addition to redundant berths at any given terminal, Washington State Ferries also has additional terminals that could be used should all the berths at a terminal be unusable. An official from Washington State Ferries said that ensuring the continuity of service for the ferries is important in his region because the ferry

system could experience an increase in the number of users while the road systems are being repaired.

**Figure 4: Three Redundant Berths at Seattle/Puget Sound Region’s Washington State Ferries Ferry Terminal**



Source: GAO. | GAO-15-159

Note: Washington State Ferries also has additional terminals that could be used if all berths at a terminal become unusable.

All nine transit agencies provided us with information about, or told us about, their efforts to coordinate with other local or regional agencies to, for example, help prepare for, respond to, and recover from catastrophic events and to help ensure that their systems can resume or continue operations if such events were to occur. We found transit agencies that have, as FTA suggests, formal agreements with other transit or transportation agencies to facilitate the coordination, and other transit agencies that participate in local or regional transit coordination groups. For example, the Seattle/Puget Sound region’s King County Metro Transit has a memorandum of understanding with the City of Seattle’s Department of Transportation which defines and coordinates the actions each agency will take during snow events (such as providing certain bus services and removing snow on roads). Additionally, two transit agencies we visited in the Los Angeles region have a formal agreement with other transit agencies in California that describes how transit agencies in the state will, in an emergency, receive and provide mutual assistance to

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each other in the form of personnel, services, and equipment so that transit systems can continue to operate. Separately, officials from Philadelphia's SEPTA told us that while they do not have a formal agreement with other local transit agencies, they participate in a regional transit working group to, among other things, address common security-related issues, coordinate drills and training, and efficiently administer and procure certain security equipment and other services.

While we did not assess the effectiveness of the selected transit agencies' coordination efforts with other state and local agencies, our July 2009 report on disaster assistance stated that stakeholders faced obstacles with coordination and collaboration after the 2005 Gulf Coast hurricanes.<sup>46</sup> Based on our review of five past disasters, we found that collaborative practices could help communities recover and rebuild from catastrophic events.<sup>47</sup> Accordingly, we recommended that FEMA establish a mechanism for sharing information and best practices focused on disaster recovery, including practices that promote effective collaboration. In September 2013, we found that FEMA had implemented this recommendation.

In addition, eight transit agencies we visited showed or told us about changes they have made to their physical infrastructure to mitigate the impacts of catastrophic events on their transit systems. For example:

- Miami-Dade Transit made changes to better protect its electrified third rail and reduce damage and replacement costs. This transit agency uses cover boards to protect the electrified third rail that supply power to its trains. Officials from this transit agency told us that hurricane winds ripped off cover boards in some places, damage that prompted them to look for better solutions to protect the third rail. As a result, officials installed newly designed cover boards that allow winds to flow through the cover, rather than catch the wind—thus allowing the cover

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<sup>46</sup> GAO, *Disaster Recovery: Experiences from Past Disasters Offer Insights for Effective Collaboration after Catastrophic Events*, [GAO-09-811](#) (Washington, D.C.: July 31, 2009).

<sup>47</sup> The five disaster discussed are the Loma Prieta Earthquake, Hurricane Andrew, the Northridge Earthquake, the Kobe Earthquake, and the Grand Forks/Red River Flood. We found that key collaborative practices include (1) developing and communicating common goals to guide recovery, (2) leveraging resources to facilitate recovery, (3) using recovery plans to agree on roles and responsibilities, and (4) monitoring, evaluating, and reporting on progress made toward recovery. See [GAO-09-811](#).

boards and the third rail to better withstand hurricane winds (see fig. 5.)

**Figure 5: Miami-Dade Transit's Cover Boards for the Third Rail: Old Design Can Be Blown Off by High Winds (Left), and New Design Mitigates Wind Damage (Right)**



Source: GAO. | GAO-15-159

- Philadelphia's SEPTA changed its roadside curbs and subway vents to reduce subway flooding. Flooding is one of the key risks to this transit agency's rail system. Officials explained that subway flooding occurs, in part, because water accumulates near roadside curbs that have deteriorated, thus allowing water to enter vents that provide air to the underground train system. To remedy the problem, the transit agency raised curbs or vents throughout the city to minimize water flow into the vents (see fig. 6). Prior to implementing this renovation, the transit agency had previously relied on a strategy of covering vents susceptible to flooding with plywood and sand bags in advance of large storms, but this process was labor intensive and dependent on how much time was available before a storm.

**Figure 6: Deteriorated Curb That Allowed Water to Easily Enter Subway (Left) and Raised Curb and Vent That Minimized Water Flow into Subway (Center and Right)**



Source: GAO. | GAO-15-159

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## Transit Agencies Face Challenges in Placing Priority on Resilience and with Certain Aspects of Some Federal Grants

Officials from DOT, DHS, transit agencies and emergency management offices we visited stated that transit agencies face challenges related to placing priority on resilience and some aspects of certain grant programs that can help make transit systems resilient.<sup>48</sup> These challenges were the most frequently cited challenges across the agencies we reviewed.<sup>49,50</sup> DOT, DHS, and some transit agencies have taken or are taking some actions to address identified challenges.

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## Placing Priority on Resilience May Be Challenging

Officials from DOT, DHS, and the transit agencies and emergency management offices we visited identified a variety of challenges that make it difficult for transit agencies to place priority on resilience activities.

First, officials from DOT and DHS told us that resilience may not be a priority for transit agency managers. These managers may not make resilience a priority because it is difficult for them to make the case for resilience projects and because catastrophic events occur infrequently. As far back as June 1998, we reported that state and local governments might be reluctant to take actions that improve resilience to natural hazards because, among other reasons, decision-makers may not have complete or accurate information on the extent to which averted losses

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<sup>48</sup> During interviews with officials from DOT, DHS, the nine selected transit agencies, and five selected emergency management offices, officials identified challenges when we explicitly asked them to do so or during the course of our discussion. When we report the number of agencies that identified a particular challenge, this does not necessarily mean that the remaining agencies did not also experience the challenge. It means that those stakeholders did not raise the challenge during the course of our interviews.

<sup>49</sup> The methodology we used to determine the most frequently cited challenges is described in appendix I.

<sup>50</sup> In addition to the challenges frequently identified by agencies we interviewed, we also heard about other challenges, but less frequently, that transit agencies face with making their systems resilient to catastrophic events. These challenges, as identified by transit agencies, include (1) incorporating resilience into transit agency planning or project design; (2) limited ability for smaller transit agencies to address resilience because of their size (such as limited staff and funding resources); (3) limited flexibility in addressing local or transit agency risks; (4) limitations with federal grant requirements (such as a requirement to provide a percentage of non-federal funds to FEMA-funded projects); (5) aging infrastructure; and (6) duplication and redundancy across federal efforts.



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could exceed the increased cost of resilience actions.<sup>51</sup> Gathering comprehensive and reliable data to make decisions about cost-benefit tradeoffs continues to be difficult. FTA has developed a tool to help transit agencies in Sandy-affected areas evaluate the cost-effectiveness of resilience projects in reducing the vulnerabilities of both an asset and of the public transportation system to future disasters. This information on cost-effectiveness was among the factors FTA used to help it determine which resilience projects would receive ERP funds. Additionally, three transit researchers whom we interviewed agreed that it can be challenging to convince management that preparing transit systems for future catastrophic events should be a priority; they further explained that this is because such events may not happen or may happen infrequently.

Second, officials from four transit agencies we visited as well as DOT, and DHS indicated that resilience activities compete with other priorities for funding.

- *Competing with other transit agency priorities:* Resilience activities may compete with other transit agency priorities—such as those that address systems operations—for funding. For example, an official from Seattle/Puget Sound Region’s Washington State Ferries explained that because his transit system lost a critical source of funding—the state’s motor-vehicle excise tax—the agency needed to direct its existing funding sources to operating and construction costs, which left little room for resilience-related activities, such as building redundant systems. Officials from Philadelphia’s SEPTA told us that they sometimes have to prioritize funding to address federal requirements—such as a requirement to install positive train control on railroads used to transport commuters, inter-city rail passengers, or hazardous materials—which limits the funding that is available for other agency activities such as those that help make their system resilient.<sup>52</sup>

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<sup>51</sup> GAO, *Disaster Assistance: Information on Federal Disaster Mitigation Efforts*, [GAO/T-RCED-98-67](#) (Washington D.C.: Jan. 28, 1998).

<sup>52</sup> Positive train control is a communications-based system designed to prevent certain types of accidents caused by human factors, such as train-to-train collisions, trains entering work zones, and derailments. The Rail Safety Improvement Act required that positive train control be installed by December 31, 2015. Pub. L. No. 110-432, div.A, § 104, 122 Stat. 4848, 4856(2008). In August 2013, we found that most railroads said that they would miss the deadline due to numerous challenges caused by the breadth and complexity of installing the system. See [GAO-13-720](#), *Positive Train Control: Additional Authorities Could Benefit Implementation* (Washington, D.C., Aug. 16, 2013).

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- *Competing with other state priorities:* In 1998, 2007, and 2014, we found that state and local governments might be reluctant to invest in resilience-building activities—such as hazard mitigation—because leaders may be concerned that these activities will detract from economic development goals that may be a higher priority for communities.<sup>53</sup> According to a FEMA official, transit systems have not been high priority in states’ applications for FEMA mitigation grants, such as the HMGP, in part because states tend to focus on other priorities that are of interest to communities. The FEMA official told us, for example, that after Hurricane Sandy, a state prioritized HMGP grants for residential housing rather than for transit. An official from an emergency management office said that these competing priorities may limit the funding provided to transit agencies and affect their ability to undertake activities that could help make their systems resilient.

Third, officials from seven transit agencies and four emergency-management offices said that federal funds are not always available for transit systems’ resilience and limits their ability to undertake activities that could help make their systems resilient. Officials from some of these transit agencies said that federal funds are not always available to help them make their systems resilient to catastrophic events, particularly natural disasters, before they occur. For example, as discussed earlier, ERP funds are currently available only after an event occurs and only if Congress provides an appropriation specific to the event. Furthermore, according to officials from one transit agency and two emergency management offices, federal funds provided after a disaster to improve resilience to future disasters are limited. An official from the transit agency said that funding is limited because federal funds provided after a disaster, other than through the ERP, are largely focused on recovery and not mitigation or other activities that can be used to address resilience. An official from one of the two emergency management offices said that following a disaster, state or local funding may not be readily available to cover the federal cost sharing requirements applicable to federally funded projects, thus preventing them from receiving the federal funds. In addition, officials from some of the transit agencies said that funding for the TSGP, a grant program that helps transit agencies improve their systems’ resilience to security risks, is sporadic and difficult to obtain or

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<sup>53</sup> [GAO/T-RCED-98-67](#); GAO, *Natural Hazard Mitigation: Various Mitigation Efforts Exist, but Federal Efforts Do Not Provide a Comprehensive Strategic Framework*, [GAO-07-403](#) (Washington, D.C.: Aug. 22, 2007); and [GAO-14-603T](#).

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has declined. As discussed earlier, TSGP funds for public transit peaked in fiscal year 2009 at almost \$500 million; but were at or below \$90 million in each of the past 3 fiscal years. Miami-Dade Transit officials said that the lack of TSGP funding has made it difficult to obtain funding to implement security upgrades at facilities, and officials from Seattle/Puget Sound Region's King County Metro Transit said the decline has made it difficult to obtain funds to maintain implemented security solutions.<sup>54</sup> The four transit researchers we spoke with agreed that the availability of funds for resilience is a challenge for transit agencies. Two of these transit researchers further explained that funding resilience activities is especially challenging for smaller transit agencies or agencies that do not have enough funding from fare box revenue to address their operating costs.

Making choices about how to prioritize activities given finite resources is not a new or unique dilemma for transit agencies. In March 2006, we found that while transit agencies that operate rail systems may use FTA financial assistance for security activities, such as upgrading security technologies, they must balance and prioritize such investments in security against other competing needs.<sup>55</sup> Furthermore, making choices about how to prioritize activities, which involves the consideration of trade-offs, is similar to the process that other organizations, including Congress and federal agencies, must go through when confronted with funding requests that have merit, but exceed the amount of available funding.<sup>56</sup> Nonetheless, as noted below, some stakeholders we interviewed are considering actions to assist transit agencies place priority on resilience activities.

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<sup>54</sup> Maintaining resilience-related infrastructure improvements and technologies after they have been implemented was another frequently cited challenge by transit agencies, with five transit agencies citing this as a challenge.

<sup>55</sup> GAO, *Passenger Rail Security: Evaluating Foreign Security Practices and Risk Can Help Guide Security Efforts*, [GAO-06-557T](#) (Washington, D.C.: Mar. 29, 2006).

<sup>56</sup> For example, in April 2009, we found that while Congress and federal agencies expressed frustration with the budget and appropriations process, it is in the annual appropriations process that the Congress considers, debates, and makes decisions about the competing claims for federal resources. Congress is confronted every year with claims that have merit but which in total exceed the amount the Congress believes appropriate to spend. It is not an easy process—but it is an important exercise of the constitutional power of the purse. GAO, *VA Health Care: Challenges in Budget Formulation and Issues Surrounding the Proposal for Advance Appropriations*, [GAO-09-664T](#) (Washington, D.C.: Apr. 29, 2009).

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Philadelphia's SEPTA and FTA are considering some actions that could help place priorities on resilience activities within their agency:

- While participating in an FTA-funded climate-change adaptation-assessment pilot program, officials from SEPTA found, that one strategy that could help ensure that the agency addresses resilience across a range of weather events is to incorporate assets' climate change vulnerabilities in SEPTA's asset management program. The 2013 report that summarized the results of the pilot program concluded that if this vulnerability information is included in an asset management program, decision-makers can use this information to help them determine how to address those issues in future maintenance or new construction investments.<sup>57</sup> This agency has incorporated elements of this strategy into its asset management program.
- FTA issued an *Advance Notice of Proposed Rulemaking* on an asset management system, as discussed earlier, and is considering whether risk analyses, among other things, should be included in transit agencies' asset management plans to help transit agencies make investment and other decisions.<sup>58</sup> While the proposed rulemaking does not specifically refer to transit system resilience, consideration of a transit system's risk during investment prioritization decisions could help minimize those risks and thus improve the resilience of a system.

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### Some Federal Grant Program Requirements Pose Challenges for Use of Federal Funds for Resilience

Transit agency, emergency management, and federal officials also cited challenges specifically related to some aspects of federal grants, challenges that have affected how or the extent to which transit system resilience is addressed. These challenges are discussed below.

*Incorporating resilience into disaster recovery:* Officials from emergency management offices in Miami-Dade County and Philadelphia as well as officials from Philadelphia's SEPTA and a FEMA official, identified challenges with incorporating mitigation activities into disaster recovery due to the difficulty of coordinating

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<sup>57</sup> ICF International, *A Vulnerability and Risk Assessment of SEPTA's Regional Rail: A Transit Climate Change Adaptation Assessment Pilot*, a report prepared at the request of the Federal Transit Administration, Department of Transportation (August 2013).

<sup>58</sup> 78 Fed. Reg. 61252 (Oct. 3, 2013).

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available funding streams. As discussed above, mitigation is one action that can contribute to resilience. After a presidentially declared major disaster or emergency, an affected state can request funds from FEMA's Public Assistance grant program for response and recovery efforts, such as for repairing or replacing disaster-damaged transportation infrastructure.<sup>59</sup> However, an official from one of the emergency management offices said that because federal and state processes for distributing federal funds that can be used for mitigation (i.e., FEMA's Hazard Mitigation Grant Program funds) takes time, transit agencies may not be able to use these funds during their recovery efforts, such as those that occur with the help of the Public Assistance grants. Further, an official from another emergency management office said that hazard mitigation grants become available after much of the rebuilding is under way or complete. Given the different timelines for the Public Assistance and Hazard Mitigation Grants, opportunities to incorporate resilience into projects occurring during the recovery stages of a disaster can be missed. Determining when agencies should focus on resilience and recovery can be difficult. In March 2010, we found that state and local governments might not have the capacity to focus on recovery soon after a disaster.<sup>60</sup> We have ongoing work to evaluate select efforts to facilitate resilience as part of the Sandy recovery effort. We plan to issue a report on these efforts in 2015.

- *Decreased focus on regional resilience.* Officials from Philadelphia's SEPTA, the Los Angeles area's Orange County Transportation Authority, the Los Angeles County Metropolitan Transportation Authority, and one emergency management office said that changes with FEMA's TSGP grant program has affected efforts to improve regional resilience. In fiscal year 2011, DHS revised its policy for the TSGP grant program from one where the funds were allocated to high-risk regions and given to transit agencies in those regions using a collaborative process to a nationally competitive grant program where all transit agencies nationwide competed for the funds. When grants were regionally allocated, transit agencies were required to work together to determine how best to request and allocate TSGP funds for their region. According to officials from two transit agencies,

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<sup>59</sup> FTA ERP funds are not available to transit agencies unless Congress provides an appropriation for the ERP, as it did in the aftermath of Hurricane Sandy.

<sup>60</sup> [GAO-10-404](#)

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such collaboration with other transit agencies in their region is important because a city's transit network is often comprised of transit systems run by multiple transit agencies. However, when the grant program became competitive, officials from three transit agencies and one emergency-management office said that transit agencies had less incentive to collaborate with other transit agencies in their region because all the agencies were competing for the same pool of TSGP funds. FEMA officials told us that the grant program still encourages regional collaboration because such collaboration is a criterion for determining grant distributions. Furthermore, one emergency-management office said that changes with another FEMA grant program—the Regional Catastrophic Preparedness Grant Program—also potentially limited regional coordination. In fiscal year 2012, the Regional Catastrophic Preparedness Grant Program—which was used to support regional all-hazard planning for catastrophic events—was discontinued as it was no longer funded. According to FEMA officials, this grant program enabled agencies, including transit agencies, in a region to coordinate their preparedness and planning efforts with other agencies in their region. However, officials from the emergency management office told us that the discontinuance of the grant program may limit transit agency coordination and cooperation that existed under the grant as agencies compete with one another for other FEMA preparedness grants. Despite transit agencies' decreased incentive to coordinate with other transit agencies, we found—as we discuss earlier—that transit agencies continue to coordinate with other transit agencies through formal agreements or by participating in local or regional transit coordination groups.

- *Short period of performance to address resilience of certain assets:* In fiscal year 2012, DHS changed the period of performance for the TSGP grants from 3 to 4 years— depending on the type of project—to 2 years. According to DHS officials, DHS took this action to encourage transit agencies to use their grants quickly. Officials from Philadelphia's SEPTA told us that DHS's requirement that transit agencies complete projects funded by TSGP grants in 2 years makes it challenging for their agency to undertake projects that address resilience. Specifically, these officials explained that because of DHS's emphasis on completing projects within 2 years, transit agencies cannot fully address the resilience of the assets needing greater attention because projects related to these assets generally take longer than 2 years to complete. According to DHS officials,

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based on a review of seven transit agencies, the length of time for completing transit security projects that require construction ranged from about 2.5 to about 5 years, depending on the type of project.<sup>61</sup> Transit agencies may request an extension to the 2-year period of performance; however, according to DHS guidance on the grants, such extensions are only given under exceptional circumstances, such as if a natural disaster or other major event were to occur or if complex environmental reviews cannot be completed within the time frame. A DHS official told us that his agency recognizes the 2-year performance period to be a challenge for transit agencies and said that DHS is working with transit agencies and Congress to find the right balance between getting funding deployed versus the length of time it takes to complete more complex projects. The extent of this challenge may differ depending on each agency's system. For example, a transit researcher we spoke to said that in general, shorter performance periods are typically not a problem for transit agencies that primarily have bus fleets because projects associated with buses do not take as long to complete as rail projects.

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## Concluding Observations

One of the goals of public transit systems, post-disaster, is to resume operations as quickly as possible. After catastrophic events, a system can take days, weeks, or months to fully recover and rebuild. In the past 13 years, the vulnerability of transit systems to catastrophic events has been repeatedly demonstrated as these events, particularly extreme weather events, have occurred more frequently. Such events are expected to increase going forward. Given that catastrophic events can be challenging to predict, transit agencies find themselves in the difficult situation of trying to balance the needs of daily operations with preparing for such events. There is a constant need to balance the immediate needs with the "what-if" needs as decision-makers prioritize use of their finite resources. The role of the federal government in providing resilience-related assistance to transit agencies may fluctuate, depending on the catastrophic events and the related authority and appropriations Congress provides to DOT and DHS. While it is not possible to make a transit system completely immune to catastrophic events, continued efforts by all parties to place priority on and improve resilience through preparedness, response, recovery, and mitigation can help our nation's

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<sup>61</sup> We did not independently verify these time frames.

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transit systems potentially better withstand and recover from such events and reduce their human and economic impacts.

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## Agency Comments

We provided DHS and DOT with a draft of this report for review and comment. DHS and DOT provided technical comments, which we incorporated in the report as appropriate.

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We are sending copies of this report to the appropriate congressional committees, the Secretary of Transportation, the Secretary of Homeland Security, and other interested parties. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or [WiseD@gao.gov](mailto:WiseD@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix II.



David J. Wise  
Director, Physical Infrastructure



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# Appendix I: Objectives, Scope, and Methodology

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This report examines (1) how DOT and DHS help transit agencies make their systems resilient to catastrophic events; (2) actions selected transit agencies take to make their systems resilient; and (3) challenges transit agencies face with making their systems resilient to such events. Catastrophic events are those that result in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national morale, and/or government functions. Our review focuses on catastrophic events caused either by nature (e.g., hurricanes, flooding, fires) or by humans (e.g., security events, including terrorism). Transit modes included in our review include rail transit (light-rail, heavy rail, commuter rail), bus, and ferry systems.

To determine the activities DOT and DHS take to help transit agencies make their systems resilient to catastrophic events, we reviewed and analyzed documentation from the two federal agencies on their relevant funding programs, requirements, guidance, policies, and technical assistance.<sup>1</sup> We also interviewed officials from these two agencies. In addition, we reviewed funding data from DHS for the Transit Security Grant Program from fiscal years 2005 through 2014 and assessed the reliability of the data by interviewing agency officials. We determined that the data were reliable for the purposes of describing the amount of funding awarded for public transit. Also, to understand the federal government's overall approach to addressing resilience, we reviewed Executive Orders, Presidential Policy Directives, Homeland Security Presidential Directives, and national policy statements or plans for national critical infrastructure protection and climate change adaptation. Furthermore, we interviewed officials from transit agencies and emergency management offices in five metropolitan areas for their observations on DOT and DHS assistance. The five selected areas and the criteria we used to select them are described below.

To identify actions selected transit agencies take to make their systems resilient, we reviewed documentation and interviewed officials from nine transit agencies and five local emergency management offices in five metropolitan areas (see table 4).<sup>2</sup> The five selected areas are Los

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<sup>1</sup> The U.S. Coast Guard has responsibilities over the security of ferry systems. We did not include the Coast Guard in the scope of our study.

<sup>2</sup> We interviewed officials in-person or over the phone, or obtained responses to our interview questions via email.

Angeles, California; Miami, Florida; Philadelphia, Pennsylvania; Seattle/Puget Sound Region, Washington; and Washington, D.C. We selected the five metropolitan areas because they (1) are located in different geographic areas and have the potential exposure to different types of weather- and non-weather related risks (e.g., hurricanes, earthquakes, terrorism), (2) have varying types of transit modes (light-rail, heavy rail, commuter rail, bus, and ferry), and (3) are among the 10 largest metropolitan areas in terms of transit ridership.<sup>3</sup> While we did not interview all transit agencies in each metropolitan area, we selected those that had relatively high transit ridership, were located in the city, or provided service to the city. While the information we obtained from the five areas is not generalizable to transit systems nationwide, the selected areas have some of the larger transit systems in terms of ridership. When we report the number of agencies that took a particular action to make their systems resilient, this does not necessarily mean that the remaining agencies did not also take those actions. It means that those agencies did not discuss those actions in documents provided to us or during the course of our interviews.

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<sup>3</sup> Ridership is based on FTA's 2011 National Transit Database's total unlinked passenger trips. Total unlinked passenger trips are the number of passengers who board public transportation vehicles. Passengers are counted each time they board vehicles no matter how many vehicles they use to travel from their origin to their destination.

**Table 4: Emergency Management Offices and Transit Agencies Selected for GAO’s Review**

Metropolitan area	Selected emergency management office	Selected transit agency
Los Angeles, California	Los Angeles Operational Area Critical Incident Planning and Training Alliance, whose core members are the Los Angeles Sheriff’s, Police, and Fire Departments; the Los Angeles County Fire Department and Office of Emergency Management; and the Red Cross. The Los Angeles County Metropolitan Transportation Authority participates in this Alliance.	Los Angeles County Metropolitan Transportation Authority
		Orange County Transportation Authority
		Southern California Regional Rail Authority (Metrolink)
Miami, Florida	Miami-Dade’s Office of Emergency Management, a Division of Miami-Dade Fire Rescue	Miami-Dade Transit
Philadelphia, Pennsylvania	Philadelphia Office of Emergency Management	Southeastern Pennsylvania Transportation Authority (SEPTA)
Seattle/Puget Sound Region, Washington	City of Seattle Office of Emergency Management	Washington State Ferries
		King County Metro Transit
		Sound Transit
Washington, D.C.	District of Columbia Homeland Security and Emergency Management Agency	Washington Metropolitan Area Transit Authority (WMATA)

Sources: GAO | GAO-15-159.

Note: In each metropolitan area, we selected transit agencies that were located in the city itself or provided service to the city. Also, we selected transit agencies that had relatively high ridership.

To identify challenges transit agencies face with making their systems resilient to catastrophic events, we asked officials from DOT, DHS, the nine transit agencies, and five emergency management offices to identify challenges. Officials identified challenges when we explicitly asked them to identify them or during the course of our discussion. We analyzed the information gained from these officials to identify the most frequently cited challenges. The most frequently cited challenges were those that were cited by four or more transit agencies (about half of the transit agencies selected), two or more emergency management offices (about half of the emergency management offices selected), or both DOT and DHS. When we report the number of agencies that identified a particular challenge, this does not necessarily mean that the remaining agencies did not also experience the challenge. It means that those stakeholders did not raise the challenge during the course of our interviews. We also interviewed four researchers knowledgeable in transit systems, emergency management, or federal transportation programs to further understand the challenges transit agencies face. We identified these researchers based on our review of transportation research institutes and recommendations from officials we interviewed.

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We conducted this performance audit from October 2013 through December 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions on our audit objectives.

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# Appendix II: GAO Contact and Staff Acknowledgments

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## GAO Contact

David J. Wise, (202) 512-2834 or [wised@gao.gov](mailto:wised@gao.gov)

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## Staff Acknowledgments

GAO staff who made significant contributions to this report include Catherine Colwell, Assistant Director; Melissa Bodeau; Martha Chow; Roshni Davé; Peter DelToro; Lorraine Ettaro; Kathryn Godfrey; David Hooper; and Owen Starlin.

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